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Initial Exploration of Semi-exclusive Scattering in $x > 1$ Region with $^{3,4}He(e, e'p)$ Reactions

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Abstract

We propose to study high momentum components in $^{3,4}He$ via $(e,e'p)$ reactions at large Q^2 and $x > 1$ in the missing energy range from the two-body breakup into the continuum. At $Q^2 \simeq 2$, 3 $(\mathrm{GeV/c})^2$, we propose to measure in parallel kinematics the $^{3,4}He(e,e'p)$ cross-sections at $y = -300$ MeV/c ($x = 1.61, 1.51$, respectively) and, further away from the quasi-elastic peak, at $y = -450$ MeV/c ($x = 1.98, 1.80$, respectively). To further our understanding of the underlying currents, a separation of the longitudinal(L)/transverse(T) structure functions in $^3He(e,e'p)$ is proposed at $Q^2 \simeq 2$ $(\mathrm{GeV/c})^2$ and $y = -300$ MeV/c ($x = 1.61$). These systematic studies of the semi-exclusive reactions in the $x > 1$ side of the quasi-elastic peak will provide new detailed information on high momentum components and NN correlations in nuclei and will help to constrain modern theoretical calculations on few-body systems. The kinematics are selected such that meson exchange currents and final state interaction effects will be suppressed. Hence, NN correlations in nuclei can be studied with less ambiguity.